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ABSTRACT

This review of literature on the topic of learning style opens with a history of the development of theories on information processing habits which represent the learner's typical modes of perceiving, thinking, remembering, and problem solving. A discussion is included on writings about the sense modalities used in learning--visual, aural, kinesthetic, and tactual. Research writings are reviewed on the subjects of: (1) learning style stability; (2) learning style and teaching style; (3) learning style and reading and math achievement; (4) age and sex in relation to learning style; (5) learning style and self-concept; (6) learning style of gifted students and slow learners; and (7) learning style and sociometric choices. A bibliography of the 128 references cited in the review is included. (JD)

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LEARNING STYLE

A REVIEW OF THE LITERATURE

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TABLE OF CONTENTS

Brief History of Learning Style..... 1

Learning Style..... 2

Cognitive Style..... 10

Learning Style Inventory..... 10

Learning Style Research..... 13

Consistency..... 13

Learning Style and Teaching Style..... 13

Learning Style and Reading and Math Achievement..... 20

Age and Sex in Relation to Learning Style..... 23

Learning Style and Self-Concept..... 25

Learning Style and Gifted Students and Slow Learners..... 26

Learning Style and Sociometric Choices..... 27

References..... 29

LEARNING STYLE

A REVIEW OF THE LITERATURE

What is "learning style"? What do some researchers say about "learning style"? These questions guide the review of the literature in this chapter. According to Guild (1980), the term "learning style" was relatively new in the early 1970s, but by the end of the decade a significant number of studies and theoretical articles became available. In 1975 a computer search of ERIC of the term "learning styles" in titles yielded less than 50 citations; in 1979 it yielded over 800 citations.

Brief History of Learning Style

Attempts to teach reading and writing through the auditory, visual, and kinesthetic modalities have been documented since pre-Christian Greece, according to Fernald (1943). Montessori's work (1912) contained materials that she designed to promote sensory and motor development.

Coop and Sigel (1971) noted that German psychologists discussed cognitive style at the turn of the century; Allport used the word style in his work of the

1930s; and Witkin began his work in perceptual styles in the 1940s.

Kephart (1960) reinforced Montessori's ideas that sensory motor activities were the basis for later academic and survival skills. Kephart felt that this held true for all children not just those with learning disabilities. He stressed that sensory motor or perceptual motor manipulation was necessary to allow the child to fit his behavior to the changing demands of the contemporary society.

Kagan, Moss, and Sigel (1963) developed tests to measure how people categorized objects. They were interested in cognitive style according to the methods people used to sort information in connection with sensory perception.

A program that was both corrective and preventive that worked in the area of the visual modality was developed by Frostig and Horne (1964). In 1970 Mills published the Learning Methods Test; Dunn et al. (1975) designed the Learning Style Inventory; and Barbe and Swassing unveiled the Swassing-Barbe Modality Index in 1979.

Learning Style

In this study the interest in learning style was primarily directed to the modalities of learning; the auditory, tactile, visual, and kinesthetic modalities, and items that influenced these modalities.

In writing about learning styles Barbe and Milone (1981) stated that

> One of the most promising movements in contemporary education is the attention being given to student learning styles. The movement is based on the idea that students vary in their approach to learning, so . . . "no single instructional process provides optimal learning for all students" (Bracht, 1970, p. 627). (p. 378)

Barbe and Milone continue:

> Perhaps the most thoroughly investigated of the learning styles are those involving perception, the process most intimately associated with learning. Educators usually refer to the channels through which perception occurs as modalities: vision, audition, and kinesthesia. The channels most efficient for processing information are referred to as modality strengths. (p. 378)

Rosenberg (1968) feels that

> Learning styles refer to an individual's characteristic pattern of behavior when confronted with a problem. If a person is observed in a number of different problem-solving situations, a modal pattern of behavior can usually be ascertained. It is this modal pattern of his behavior that he refers to as his style. (p. 22)

Hill (1976) suggested that individuals assimilate data from their environment through their five primary senses, that they establish at a subliminal level one or a combination of input channels as most productive, and that they develop ways of responding which are consistent with their preferred learning patterns. In Hill's system individuals can acquire meaning from their environment through the senses of hearing (auditory), smell (olfactory), taste (savory), touch (tactile), and sight (visual).

Barbe and Swassing (1979) wrote about these senses (modalities):

> A modality is any of the sensory channels through which an individual receives and retains information. A critical component of this definition is the phrase, "receives and retains," since it implies that sensation, perception, and memory constitute what we are calling modality. Because these three processes are the essence of learning itself, the modalities can be called the keys to learning. (p. 1)

Barbe and Swassing stated that there are three views of modality:

1. Modality as a fixed neurological characteristic
2. Modality as a preference
3. Modality as a measurable behavior (pp. 3-5)

The fixed neurological view treats modality as a physiological characteristic. In this view modality strength is determined chiefly by hereditary factors, and changes very little between childhood and adulthood. It is defined as a fixed neurological characteristic and is equated with sensation only.

> Although we do not feel that modality strength can be fully explained by approaching it as a fixed neurological characteristic, we do agree that each one of us is predisposed to certain modality strengths. . . . and it is reasonable to assume that modality strengths may be among these factors. (Barbe & Swassing, 1979, pp. 3-4)

The basis for describing modality as a preference takes the view that individuals can give a definite answer when asked how they learn best--by seeing, hearing, or doing.

Barbe and Swassing stated:

> Personal preference is not very reliable since most individuals are not well trained observers of their own behavior. Their judgments will be inconsistent, and will reflect the immediate situation rather than long standing behaviors. (p. 4)

The definition of modality strength in Barbe and Swassing's view of modality as a measurable behavior is the ability of an individual to perform an academically relevant task in each of the main modalities. Barbe and Swassing proposed a definition that acknowledged the role of both heredity and the environment in shaping an individual's modality strengths. They also acknowledged that modality preferences exist. They made a qualification to the acknowledgement that the manner in which an individual is most comfortable receiving information is not always constant with the way in which information is most efficiently received and processed.

Barbe and Swassing (1979) wrote of the "Educationally Relevant Modalities." They said the three modalities that have the greatest utility in the classroom are the visual, auditory, and kinesthetic.

According to DeCecco (1968), learning styles are "personal ways in which individuals process information in the course of learning new concepts and principals" (p. 75). Along the same line, Dunn (Note 1) stated that learning style is not the way you learn on a daily basis

but the way you are when you are really trying to learn something new.

Tallmadge and Shearer (1969) defined learning style as

> an attribute of an individual which interacts with instructional circumstances in such a way as to produce differential learning achievement as a function of these circumstances. (p. 222)

Dunn, Dunn, and Price (1977) stated:

> How a student learns is perhaps the most important factor related to academic achievement, but relatively few instruments have been published that purport to diagnose those elements. (p. 419)

Other studies mentioned that a child's learning style should be considered when developing an individualized program of learning (DeCecco, 1968; Rosenberg, 1968; Tallmadge & Shearer, 1969).

Taba, Levine, and Elzey (1964) defined learning style as the

> modes of thought which an individual employs rather persistently in the variety of different cognitive tasks, such as: selecting a basis for grouping objects, determining how to label what he sees and how to organize the various aspects of his environment. (p. 8)

Gregorc (1979) developed a definition of learning styles that read:

> Learning style consists of distinctive behaviors which serve as indicators of how a person learns from and adapts to his environment. It also gives clues as to how a person's mind operates. (p. 234)

Dunn (1980b) described learning style as "the manner in which many different elements from five basic

stimuli affect a person's ability to absorb and retain" (p. 1). She listed the five basic stimuli as environmental, emotional, psychological, physical, and sociological.

Barbe and Milone (1980) felt:

> Neither nature or nurture fully accounts for the development of a modality strength. Most likely, a person's heredity, maturation, learning, and cultural upbringing are all contributing factors. While sex and handedness have little impact on modality strengths, the influence of age is quite strong. Children in the early elementary grades have more well-defined strengths and they tend to be auditory rather than kinesthetic. As children progress through elementary school, their modalities become mixed and interdependent and shift decidedly toward the visual and kinesthetic. By adulthood, many people have mixed modality strength.
>
> Children with mixed modality strengths seem to have an advantage in the classroom. Though they are no more or less intelligent than students with a single strength, they are able to process information efficiently no matter how it is presented. The other students learn much more easily when they are taught through their particular modality strengths. (p. 45)

Carbo (1980) found statistically significant results when reading treatments were matched to children's modality strengths. Burton (1980) found that when treatments were not matched with modalities, visual methods were more successful with primary children than auditory approaches despite the fact that the youngsters had been taught phonetically.

Urbschat (1977) in her dissertation which included 135 first-grade students found that modality strengths

can be identified among first graders; superior and significant results occurred when a treatment was matched to the appropriate modality; and most of the first graders in the study found it easier to learn through either a visual or a combination of auditory/visual treatment rather than solely through an auditory approach. Regardless of the child's modality strength, a treatment that included a visual approach achieved significance at .05 level with auditory, visual, and auditory/visual children. No one modality evidenced superiority.

According to Price (Note 2) young children appear to learn more easily when taught through tactile/kinesthetic methods; those preferences evolve into visual strengths as they mature at different rates; most, however, do not develop the ability to learn and remember well through their auditory sense until the intermediate-elementary years.

Citing the studies of Carbo, Burton, Urbschat, and Price listed above, Dunn (1981) stated that:

1. Reading treatments should match individual students' existing current perceptual strengths.

2. For non-auditory learners, beginning reading should be taught through tactile/kinesthetic resources that are strongly interfaced with visuals. (p. 1)

Barbe and Milone (1981) made seven statements about modality that came from their research:

1. Students vary with respect to their modality strengths.

2. Modality strength is not a fixed characteristic.

3. Modalities become more integrated with age.

4. There is no clear difference between modality characteristics of boys and girls.

5. Handedness and modality strengths do not seem to be related.

6. Race and modality strengths were independent.

7. There is an interaction between student and teacher modality strengths. (pp. 378-379)

Barbe and Milone stated:

> Modality strengths change with age. Primary children are more auditory than visual, and are least well developed kinesthetically. Between kindergarten and sixth grade a modality shift occurs. Vision becomes the dominant modality and kinesthesia overtakes audition. (p. 378)

Dunn and Carbo (1981) disagreed with Barbe and Milone's contention that primary grade children are more auditory than visual and learn least well kinesthetically. They said that contention is not supported by the research Barbe and Milone cite.

Barbe and Milone (1981) wrote:

> Our findings support the idea that student modality strengths should be considered in instructional planning, including selecting or developing media and materials and designing the physical plant. (p. 379)

Banks (1973) stated that

> learning style is a significant aspect of an individual's capacity to learn. Methods of evaluation should be developed to assess an individual's learning style.

The Learning Style Inventory

The Learning Style Inventory (LSI)(1978) is an instrument for the identification of preferred learning styles. The LSI provides a diagnosis and suggests prescriptions for individual student learning. It is based on factor analysis and is a comprehensive approach to the diagnosis of and individual's learning style. The LSI contains many elements in five basic stimuli. The basic stimuli are environmental, emotional, psychological, sociological, and physical. The inventory consists of 104 items related to the five basic stimuli. Among the elements reported by the inventory are learning preferences in the visual, auditory, tactile, and kinesthetic modalities.

Cognitive Style

Many learning styles researchers take cognitive style into consideration so a section on cognitive style was included in this review of the literature.

Kagan et al. (1963) defined cognitive style as "stable individual preferences in mode of perceptual organization and conceptual categorization of the external environment" (p. 74). Grieve and Davis (1971) said that "cognitive style is concerned primarily with the manner in which an individual perceives and analyzes a

complex stimulus configuration" (p. 137). Cognitive style, according to Coop and Sigel (1971), means "consistencies in individual modes of functioning in a variety of behavioral situations" (p. 152).

Witkin, Moore, and Goodenough (1977) defined cognitive styles as a process

> concerned with form rather than content of cognitive activity. They refer to individual differences in how we perceive, think, solve problems, learn, relate to others, etc. (p. 15)

According to Kirby (1979) two studies, one by Gardner (1959) and the other by Holzman and Klein (1954) began the inquiries that led directly into cognitive research when they looked at "ego structures," which were presumed to be linked to the way people express, reroute, or delay various instinctual drives. Within such contexts, cognitive style at first appeared to be structural. Not until much later would it be viewed as a more dynamic process of adaptation to the environment.

Witkin (1967), often called the "Father of Cognitive Style," focused on perception. At first field independence and dependence were viewed as something of an either/or arrangement; it later became more common to look for gradations of type (more or less field independence).

Kagan et al. (1963) developed tests to measure how people categorized objects. Kagan's group looked at

cognitive style according to how people sorted things-information-now in terms of a more basic interpretation of sensory perception.

Kirby (1979) contained a section comparing and contrasting cognitive style and learning style. Kirby cites Messick's (1976) multiple definition of cognitive style:

> (1) [As] personal characteristics that may interact with treatment variables to moderate learning, retention and transfer; (2) as dispositions to be monitored to detect any possible undesirable side effect of instruction; (3) as qualities to be fostered either directly as specific objectives of the instructional program or indirectly as by-products of other efforts. (Messick, 1976, p. 147)

The term "learning styles" emerged in the 1970s. The researchers working in the area of learning styles take cognitive style into consideration but are generally interested in more practical educational applications and are thus more "action oriented." Researchers working in "learning style" sometimes say they are not especially interested in cognitive style because they say it is more academic. A difference between cognitive style and learning style is the number of style elements considered. Cognitive style looks at just one element of style with two polar extremes; for example, you are either field dependent or you are not (in which case you are field independent). Learning style contains many elements and they are not usually either-or extremes. A person either

has or does not have the element in one's style, and the absence of one element does not necessarily imply the presence of an opposite element. Some learning style inventories deal with the degree to which one possesses an element, while others deal merely with whether you have the element or not. For example, you may not be an auditory learner; if you are not, learning may occur through visual, tactile, or kinesthetic modes (Kirby, 1979).

Learning Style Research

Consistency

Many authors say learning styles remain stable over time and throughout a variety of tasks. Satterly and Brimer (1977) analyzed a variety of definitions of learning style and stated that

> all suggest that people behave in a typical way across a variety of tasks and that such personal consistencies remain comparatively stable over time. (p. 294)

The work of the Dunns' 18 elements and Renzulli and Smith's (1978) preferred instructional modes indicated much less consistency than implied by Satterly and Briner. Smith (1976) stated that "students' preferences may vary with the nature of the subject matter being studied and the personal dynamics of a particular teacher" (p. 2).

On the other hand, Copenhaver (1979) found that students' learning styles are consistent across subject areas, but are somewhat inconsistent across time. In both English and math classes, students tended to prefer the same learning approaches, but over a period of time, individual learning styles changed somewhat.

Dunn stated: "Learning style does not change from class to class (subject to subject). What changes is teaching style" (Note 1).

Price (1980), in a study of 3,972 children in grades three through seven, found that some characteristics tend to be stable over time, whereas others appear to follow the growth curve. One of the statistically significant findings was that the younger the child, the more tactile and kinesthetic he/she is. Those modalities are followed by development of visual strengths and, beginning with grades five and six, the development of auditory strengths.

Learning Style and Teaching Style

Teaching style can have a tremendous impact on the learner in connection with the learner's learning style.

> Teaching style consists of a teacher's personal behaviors and the media used to transmit to or receive data from the learner. Teacher behaviors and media use place demands upon both

> the teacher and the learner to align their styles. (Practical Applications of Research, 1980, p. 1)

Renzulli and Smith's (1978) research approached teaching style concepts in terms of the ways teachers organize classrooms and learning experiences. They have designed an instrument (Learning Styles Inventory) to measure students' preferences for particular modes of instruction.

In general, research indicated that schools teach mainly to one style learner, the reflective thinker. McCarthy's (1981) studies indicated that reflective thinkers make up only about 28-30% of the population, meaning that 70% of our students are not getting the education best suited to their abilities.

Kuchinskas (1979) suggested that, rather than instruction being adapted to how students learn, it presently is reflective of each teacher's own cognitive style. She suggested that unless the cognitive style of the teacher complements that of the student, learning is less likely to occur. In both Trautman (1979) and Cafferty (1980) the match of cognitive styles and complementary methods caused increased achievement whereas the mismatch resulted in the reverse.

Turner (1979) felt that the virtue of schools is that students experience a variety of teaching styles.

> A key feature of virtually all school organizations is that little effort is made to control the variability of teaching styles and learning styles. Schools rarely attempt to match the styles of learners to styles of teachers. Therein lies much of the strength and durability of the school as a social entity. (p. 257)

On the other hand Averch (1971) wrote about teaching styles:

> There is some weak evidence that the impact of an educational practice may be conditional on other aspects of the situation. Simply stated, this hypothesis argues that teacher, student, instructional method, and, perhaps, other aspects of the educational process interact with each other. Thus, a teacher who works well (is effective) with one type of student using one method might be ineffective when working with another student having different characteristics, or when using another method. The effectiveness of a teacher, or method, or whatever, varies from one situation to another. (p. xii)

Saylor and Alexander (1974) stated:

> Different procedures and methods will need to be used with different students for the attainment of educational goals, but regardless of his abilities and learning styles these efforts to personalize instruction should never deny a student the whole range of opportunities for the fullest measure of development of his unique potentialities. (p. 281)

Joyce (1981) wrote of the differences between teaching styles and teacher approach. The educational environment in matching may be considered in terms of a teacher's preferred style which is often limited and unchanging, or as a teaching approach to be provided which may require the teacher to go beyond the teacher's preferred style. The teachers with a certain style might

be matched with students with the same style or on the other hand the teachers' approach may be altered to meet, with versatility, the needs of the students.

Dunn stated that "the closer the teaching style and learning style are matched, the higher the grade point average, consistently" (Note 1).

Martin (1977) found that it is virtually impossible for a single program to complement the style differences that exist among students. When comparing students who achieve independently, those who achieve through conformity, and those who are dependent upon others for their orientations, Martin found that independent students functioned better in an "alternative" instructional environment where they achieved higher grades and satisfaction with schooling. Conversely, dependent students fared better in a traditional environment.

Dunn (Note 1) stated that in connection with teaching approach, "the important thing is to present to the strongest sense, then reinforce through the second strongest learning style."

Trautman (1979) examined student achievement in knowledge, comprehension, and application when instructional materials were matched and mismatched to identified learning style. Trautman found that whenever the instructional materials were matched correctly to the student's identified style, statistically significant academic

gains were made, and whenever the materials and styles were mismatched, achievement fell below that of both matched groups.

Fischer and Fischer (1979) stated that different instructional problems arise and different outcomes are achieved depending on the combinations (of learning styles/teaching styles) found in various classrooms. This is consistent with the analysis of Kagan (1965) who concluded:

> New pedagogical procedures should acknowledge the interactions between the dispositions of the learner and the material, and tailor presentations to the preferred strategy of the child. (p. 323)

Fischer and Fischer make the assumption that most human beings can be changed, and therefore, to some extent at least, both learning and teaching styles can be modified. They also believe that as professionals, teachers must be willing to examine and to alter their teaching styles if evidence of judgment of other professionals warrants such change. "Such change must always be guided by the key consideration: Will this change help or hinder the learner in developing toward autonomy?" (Fischer & Fischer, 1979, p. 254).

McCarthy (1979) measured the cognitive and affective progress of students whose learning style preferences were matched to special formats designed to enhance them and compared the results with the progress of students who

were not matched. The results indicated that matched students' progress in cognitive variables was significantly better than nonmatched students.

Gregorc (1979) said that from studies the following inference can be drawn:

> Teaching style is more than a methodology. It places subjective demands upon the learner who may or may not have abilities to match such demands. (p. 236)

Dunn and Dunn (1979) stated that "most teachers can respond to differences in student learning styles. . . . That is preferable to trying to match students with teachers" (p. 238). The Dunns continued by strongly stating that

> learning style and teaching style characteristics do not always cluster into such neat packages; students are not consistently one way or the other--nor are teachers; neither traditional nor informal teachers are necessarily excellent. . . ; and given the practical, "how-to" skills for teaching students through their individual learning styles, most teachers can become effective with most students. (p. 244)

Along the same line, Ellis (1979) wrote:

> Instead of attempting to make matches between teaching and learning styles, we (the teachers of Parkway School) are recognizing and capitalizing on the variety of styles that teachers possess and that they can acquire. We are trying to provide the children of Parkway School with a variety of learning environments that will be responsive to their individual learning styles. (p. 277)

Learning Style and Reading and Math Achievement

Thomas (1979) investigated modality strengths in connection with school achievement and teaching strategies based on learner characteristics. The study was conducted to determine if treatment based on modality strengths facilitated acquisition of reading and spelling skills. The subjects were children ages seven to thirteen. The first experimental group received modality matched lessons, the second experimental group received reversed modality matched lessons, and the control group received regular remediation not using patterned lessons. Thomas found there were no significant differences in the three groups. Reading improvement and spelling achievement were no greater with lesson plans progressing from areas of strength to weaker ones than with lesson plans which contradicted the learning profile. Based on Thomas' study, teaching based on modality strengths was not significantly better than teaching on modality weaknesses.

Kaley (1977) in her study of sixth-grade students found that (a) reading achievement is a statistically stronger and more efficient predictor of learning style than IQ is; (b) the higher a student's reading level, the more independent is the learning style; and (c) lower levels of reading correlate well with a need for increased dependence and teacher-directed instruction.

In the area of responding to learning styles Dunn (1980a) wrote:

> Many people of all ages, socioeconomic, and educational levels resist change because of a variety of reasons. The research, however, is adamant; achievement improves when learning styles are responded to correctly. (p. 599)

Price, Dunn, and Dunn (1976, 1977) found that in a study of 85 subjects in grades three and six from three different schools, using the Learning Styles Inventory (LSI) and the New York State's Pupil Evaluation Program (PEP) in reading that there were 11 LSI variables that significantly discriminated between subjects in the high and low reading achievement group. Among the variables of the high reading achievement group was that they did not prefer to use tactile and kinesthetic senses, while low reading achievement individuals preferred to learn using tactile and kinesthetic senses. Overall there were several areas within how students prefer to learn that related to reading achievement. Among them was the low achievers' preference to learn using tactile and kinesthetic senses.

Raines (1976) studied learning and teaching styles to determine whether differences between them had contributed to failures in math at the junior college level. It was found that there is a relationship between the instructors' styles (lecture/discussion) and the highest grade achievement groups. For the lower achievement

groups, alternate strategies of teaching were strongly recommended.

Bateman (1968) divided kindergarten children into four groups. One-half of the subjects determined by the Illinois Test of Psycholinguistic Abilities (ITPA) to be auditory were again divided--half given an auditory approach to reading, the other half visual. Those established by the ITPA as visual were similarly subdivided and taught. No significant differences were found relating modal preference and teaching method. The subjects labeled auditory made significantly greater gains in learning to read regardless of modal preference.

Freer (1971) obtained results similar to Bateman for his first-grade population. After determining individual modal preference, modal classroom instruction was instituted for half the year, but modal preference was not found to relate to modal instructional methods as affecting classroom performance. Auditory skills were the variable related to reading regardless of preference or method.

Bruininks (1969) studied 105 second- and third-grade boys. In this study the dependent variable was not success of the method by which reading was taught. The children were tested for individual modal preference, and then individual words were presented by primarily aural approaches. No modal preference-learning method interaction was found.

Ouzts (1979) studied the effects of learning modality grouping and instruction on total reading achievement and word recognition for 96 first-grade students in two public schools. The study was conducted to determine whether classroom grouping based on perceptual strengths and providing instruction to capitalize on specific strengths fostered increased reading achievement when compared to traditional grouping and a basal reader instructional approach. Significant differences were found at the .01 level in total reading achievement and word recognition favoring the students that had received the treatment which consisted of grouping and instructional procedures based on the auditory modality.

Ouzts concluded that it would appear beneficial to group and instruct students who have been identified as auditory learners. There appears to be no relationship between grouping and instructing students who have been identified as visual learners and reading performance.

Age and Sex in Relation to Learning Style

The effect of age and sex could have relevance for classroom application of learning style ideas. Research demonstrating that girls progress along the perceptual continuum faster than boys (from kinesthetic toward visual and, eventually, toward auditory preferences), has

been substantiated by Restak (1979). Evidence that many behavior differences in brain functioning are biologically inherent and unlikely to be modified by cultural factors alone has been discovered. From birth, female infants are more sensitive to sounds; their enhanced hearing performance persists throughout life and they experience decreased hearing ability much later than males. Girls speak sooner, have larger vocabularies, sing in tune at an earlier age, exceed boys in language abilities, read sooner, learn foreign languages more easily, and are likely to enter occupations involving language mastery. In addition, fewer girls than boys demonstrate speech defects; for example, stuttering occurs almost exclusively among boys. In contrast, boys excel in kinesthetic activities that require total body coordination.

Although we know that all girls and boys do not mature at the same rate perceptually, Restak's data suggest that more girls than boys can learn to read through a phonics approach, and that more boys than girls require tactile-kinesthetic resources in combination with a word recognition approach to learn how to read easily.

Price et al. (1976, 1977) in their research report on the Learning Styles Inventory (LSI) revealed that the higher the grade level the less males preferred to learn through the tactile and kinesthetic modalities. Females

in the upper grades expressed a greater preference for learning through auditory senses than did females in the lower grades. This may be due to how schools reinforce learning by teaching mainly through auditory senses. Therefore, individuals, in traditional instructional environments, gradually learn the best way to get along is to learn through the auditory sense. The higher the grade, the less females preferred to learn through tactile and kinesthetic modality; but this seems to decrease the higher the grade. This may be the result of maturation or may be due to the fact that this modality is not commonly used and reinforced in the learning environment.

Price et al. (1976, 1977) listed the statistically significant results within grade levels. Females preferred learning through the auditory sense in grades 6, 10, and 12. Males preferred learning through visual sense in grades 6 and 11 and preferred learning using the tactile and kinesthetic senses in grades 5, 6, and 8.

Learning Style and Self-Concept

In a study of 321 subjects from grades 3, 6, and 7 from 12 different schools who took the Learning Style Inventory and Gordon's How I Feel About Myself Scale, Price et al. (1976, 1977) reported that eight learning style variables were found that discriminated significantly between the subjects who had a high self-concept

and subjects who had a low self-concept. Based on this analysis the findings related directly to this review of the literature include individuals having a high self-concept did not have auditory preferences, while those having a low self-concept preferred not to learn in several ways and had auditory preferences.

According to Hudes, Saladino, and Mebach (1977) a student's confidence and achievement may be related to his/her self-concept and, therefore, students with high self-concept and an awareness of their personal learning style characteristics should be able to function well in an individualized program.

Dunn, Price, Dunn, and Saunders (1979) wrote that

> although self-esteem is not an element of learning style, it would seem to be one of its noncognitive correlates. In fact, certain researchers suggested that self-concept may be related conceptually to an individual's affective learning style. For example, a person who perceives himself as "good" and likeable may tend to identify him/herself with items assessed as liked or positive. He/she then may learn those items more readily as an extension of his/her own self-understanding. (p. 156)

Learning Style and Gifted Students and Slow Learners

Dunn stated:

> The gifted are rarely peer-oriented, will work with children with similar talents, are self-oriented through school, while slow children are teacher oriented and eventually become peer oriented, never getting out of that stage. (Note 1)

Dunn (1979) reported that Farr's (1971) work verified that slow learners do better when taught and tested in ways that respond to individual preferences. Dunn said that "slow learners tend to be tactile and kinesthetic rather than being able to learn by listening or reading" (p. 431).

Learning Style and Sociometric Choices

Semple (1982) studied one hundred twenty-eight sixth grade students to determine the relationship between subjects' learning style modality preferences and the learning style modality preferences of the subjects' sociometric choices in posed learning and social situations. The students were administered two simple sociometric tests using guidelines from Northway and Potashin (1946). The tests yielded six peer choices, three in a social situation and three in a learning situation. The subjects were then administered the Learning Style Inventory (1978)(LSI) to obtain their learning style modality preference standard scores. Each subject's LSI standard scores for the auditory, visual, tactile, and kinesthetic modalities were correlated with the standard LSI scores of the subject's chosen peers in learning and social situations.

Significant positive relationships were found where the subjects' tactile learning style standard score was correlated with the subjects' first ($p < .01$) and second ($p < .05$) sociometric choices' tactile learning style standard score in a learning situation.

The use of an alternative grouping for instruction is supported by the findings of this study. While traditional grouping in many cases is based on instructional and skills levels, the alternative grouping proposed by Semple is based on peer choices and tactile learning style preferences. This type of grouping should lead to a positive learning situation for the students because the students would be learning with peers of their choice and through their preferred learning styles.

Semple strongly suggests that students with tactile learning style preferences be grouped with their peer choices in learning situations. He also recommends that these instructional groups be taught through tactile learning style methods.

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